

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 3111606/PCT	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).	
International Application No. PCT/SG02/00296	International Filing Date (day/month/year) 27 December 2002	Priority Date (day/month/year) 28 December 2001
International Patent Classification (IPC) or national classification and IPC Int. Cl. ⁷ B24C 9/00		
Applicant JETSIS INTERNATIONAL PTE LTD et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 5 sheet(s).

3. This report contains indications relating to the following items:

- | | |
|------|---|
| I | <input checked="" type="checkbox"/> Basis of the report |
| II | <input type="checkbox"/> Priority |
| III | <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| IV | <input type="checkbox"/> Lack of unity of invention |
| V | <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| VI | <input type="checkbox"/> Certain documents cited |
| VII | <input type="checkbox"/> Certain defects in the international application |
| VIII | <input type="checkbox"/> Certain observations on the international application |

Date of submission of the demand 15 May 2003	Date of completion of the report 3 November 2003
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer VENKAT IYER Telephone No. (02) 6283 2144

Basis of the report

1. With regard to the elements of the international application:*

☐ the international application as originally filed.☒ the description, pages 1-9, as originally filed,

pages , filed with the demand,

pages , received on with the letter of

☐ the claims, pages , as originally filed,

pages , as amended (together with any statement) under Article 19,

pages , filed with the demand,

pages 10-14, received on 10 October 2003 with the letter of 10 October 2003

☒ the drawings, pages 1-3, as originally filed,

pages , filed with the demand,

pages , received on with the letter of

☐ the sequence listing part of the description:

pages , as originally filed

pages , filed with the demand

pages , received on with the letter of

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).☐ the language of publication of the international application (under Rule 48.3(b)).☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.☐ filed together with the international application in computer readable form.☐ furnished subsequently to this Authority in written form.☐ furnished subsequently to this Authority in computer readable form.☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished4. ☐ The amendments have resulted in the cancellation of:☐ the description, pages☐ the claims, Nos.☐ the drawings, sheets/fig.5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Statement

Novelty (N)	Claims 1-28	YES
	Claims	NO
Inventive step (IS)	Claims 1-28	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-28	YES
	Claims	NO

2. Citations and explanations (Rule 70.7)

The following documents are considered to be the closest available prior art (as cited in the ISR):

D1: GB 1076922 A (HENRY SIMON LTD) 26 July 1967

D2: EP 1034891 A (TORBO ENGINEERING KEIZERS GMBH) 13 September 2000

D3: US 6328638 B1 (CHINDANIEL et al.) 11 December 2001

NOVELTY & INVENTIVE STEP:

1. The characterising feature of the invention is the use of a partitioning apparatus to separate solids suspended in a slurry, the partitioning apparatus comprising: a sieve, a housing with an inlet above the sieve, an outlet above the sieve and a collection zone below the sieve, wherein slurry is fed across the sieve from the inlet and is partitioned into at least two solids streams, one flowing through the outlet, and a useable solids stream flowing out through the sieve into the collection zone.
2. Independent claims 1, 14, 27, 28 and their appended claims:
 - a) These claims deal with an abrasive slurry cutting plant and method that use the above partitioning apparatus to enable abrasive solids to be recycled.
 - b) D1 discloses a dough making process that includes an apparatus for partitioning fractions of milled cereal suspended in a slurry. The disclosed plant and process can not be applied to abrasive cutting without modification. Given the problem of recycling abrasives in a slurry cutting process, a person skilled in the art would not regard a disclosure relating to a flour milling process as relevant.
 - c) D2 discloses a slurry cutting plant however it differs from the above claims in that it discloses no recycling or partitioning of the abrasive material.
 - d) D3 discloses a plant for recycling the abrasives used in an abrasive cutting plant. The recycling plant separates the abrasive solids from the fluid, but differs from the above claims in that it uses a very different separation apparatus from that defined in the claims.
 - e) It would not be obvious to a skilled worker to modify or combine any of D1 to D3 to obtain a device that falls within the scope of the above claims and hence these claims are novel and inventive.
3. Independent claims 17, 20, 26 and their appended claims:
 - a) These claims define the partitioning device and method independent of its application to an abrasive slurry cutting apparatus. The partitioning device in these claims provides three solids streams.
 - b) D2 and D3 fail to disclose the defined partitioning device as outlined at 2(c) and 2(d) above.

REFER TO SUPPLEMENTAL BOX

Supplemental Box

To be used when the space in any of the preceding boxes is not sufficient)

Continuation of BOX V

- c) D1 provides the closest art for these claims. The features of the partitioning apparatus are disclosed by D1, with reference to figure 1, as follows:
- Housing - structure enclosing the sieve (C')
 - First inlet - inlet to C' from the macerator (8)
 - First outlet - outlet feeding into item E of figure 1
 - Second outlet - outlet to wet bran container
 - Collection zone - zone feeding into item D of figure 1
 - Sieve - C'; page 2, line 93-97
 - Flow through first outlet entraining some solids - ie the remaining endosperm page 2, line 105-107
 - Oversize material passing across the sieve to second outlet - the sieve prevents fibrous solids (ie bran) from passing through, page 2, line 106-107, and is collected in the wet bran container
 - Some sieve passable solids pass through the sieve - page 2, line 97-99
- d) The above claims require that the second outlet is that which collects the oversize materials, and as such must correspond to the outlet to the wet bran container. This means that the first outlet is that which passes down through the sieve, into item E of figure 1. The claims define that the first outlet must be above the sieve and this is not the case in D1, nor would it make sense in the context of the disclosure to make such a modification.
- e) As a result, it would not be obvious to a skilled worker to modify or combine any of D1 to D3 to obtain a device that falls within the scope of the above claims and hence these claims are novel and inventive.

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WHAT IS CLAIMED IS:

1. A method of handling abrasive solids materials used in an abrasive slurry cutting procedure of a kind which, in use, jets a high pressure abrasive slurry through a nozzle onto a work piece over and/or in a catcher tank, the handling method comprising or including catching the used abrasive slurry together with work piece kerf material in said catcher tank,

passing at least some of abrasive solids collected in the catcher tank as a slurry to a partitioning apparatus that includes a vibratory sieve,

partitioning with said partitioning apparatus the slurry to provide at least two solids streams one of which passes through the sieve and one of which passes across the sieve whilst still entrained as a slurry, and

passing as a slurry to the nozzle for jetting a pressurised or pressurisable slurry which includes partitioned solids stream that has passed through the sieve.

2. A method of claim 1 wherein there is a partitioning of the solids by the partitioning apparatus three ways, the aforementioned two solids streams and oversized solids that drop from the slurry that passes across the sieve and are at least initially retained on the sieve.

3. A method of claim 2 wherein the solids passed to the nozzle are in the size range of from about 10% to about 70% of the nozzle diameter.

4. A method of any one of the preceding claims wherein the passing as a slurry to the nozzle involves high pressure water expression from a pressure vessel.

5. A method of any one of the preceding claims wherein said partitioning apparatus comprises or includes

a housing having

a first inlet,

a first outlet, and

a collection zone or second outlet, and

a sieve disposed below said first inlet and said first outlet but above said collection zone or second outlet,

and wherein said first inlet is to receive and pass the slurry at a rate and velocity into the housing above the sieve such that at least some of the liquid component(s) of the slurry will, as a flow through, entrain small and/or less dense solids out through said first outlet,

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and wherein the rate and velocity of intake into the housing via the first inlet above the sieve and the outflow via the first outlet is such as to enable at least some oversize solids to settle on the sieve (where they are of an appropriate density) and solids (not entrained out of said first outlet) of sufficient density and of a size less than that of the oversized material to pass down through the sieve.

6. A method of claim 5 wherein said sieve is a directly or indirectly shaken and/or vibratory sieve.
7. A method as claimed in any one of the preceding claims wherein said partitioning apparatus has a collection zone and there is a valved flow path therefrom to a pressure vessel from which, as required at the nozzle, high pressure water can express the solids stream to pass to the nozzle.
8. A method as claimed in claim 7 wherein there is controllable liquid and/or slurry flow path from said pressure vessel back to said collection zone of the partitioning apparatus capable of moving as a slurry more solids from said collection zone through, via the valved flow path, to said pressure vessel.
9. A method of any one of the preceding claims wherein there is included the step of providing a replenishing feed of abrasive solids.
10. A method of claim 9 wherein said replenishing solids are introduced into said catcher tank.
11. A method of any one of the preceding claims wherein there is provided a solids agitation water feed into the catcher tank.
12. A method of any one of the preceding claims wherein there is an overflow out take of at least water from the catcher tank.
13. A method of any one of the preceding claims wherein a control system reliant on at least one sensor provides a control of valves and pumps which determines the modes of operation of the system capable of performing the method.
14. Abrasive slurry cutting plant comprising or including an abrasive supply system,
a catcher tank,
a nozzle for jetting as a slurry abrasive solids onto any appropriately positioned work piece over and/or in the catcher tank,
partitioning apparatus,
a pressure vessel,

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apparatus on demand to provide a supply of high pressure water into said pressure vessel with an ability to express water and/or a slurry therefrom,

apparatus to convey as a slurry caught solids from the catcher tank to said partitioning apparatus,

apparatus to convey a useable abrasive solids stream as a slurry from the partitioning apparatus on demand to the pressurisable vessel,

(optionally) apparatus on demand to provide a water feed to the catcher tank,

(optionally) apparatus to provide, as part of the apparatus to convey a usable abrasive solids stream, a feed of water for the solids stream to pass from the partitioning apparatus to the pressure vessel,

wherein the partitioning apparatus comprises or includes
a housing having

a first inlet,

a first outlet, and

a collection zone or second outlet, and

a sieve disposed below said first inlet and said first outlet but above said collection zone or second outlet,

wherein said first inlet is to receive and pass a slurry received from the catcher tank at a rate and velocity into the housing above the sieve such that at least some of the liquid component(s) of the slurry will, as a flow through, entrain a first part of the solids out through said first outlet,

and wherein the rate and velocity of intake of the slurry into the housing via the first inlet above the sieve and the outflow via the first outlet is such as to enable at least some oversize material to settle on the sieve and at least some sieve passable solids of greater density than the entrained solids of the flow through to pass down through the sieve.

15. Plant of claim 14 wherein there is a said collection zone which is a reservoir from which the collected solids as a slurry on demand (optionally with the addition of additional water) can be fed as a slurry to said pressure vessel from whence the solids may be

expressed to the nozzle under the action of high pressure water passing into such pressure vessel.

16. Plant of claim 14 or 15 wherein apparatus is included whereby said sieve, in use, vibrates and/or shakes and, in use, oversize material that settles on the sieve may migrate therefrom to a trap for such material.

17. **Partitioning apparatus** capable of partitioning the solids of a slurry at least three ways, said apparatus comprising or including

- a housing having
- a first inlet,
- a first outlet,
- second outlet, and
- a collection zone

a sieve disposed below said first inlet, said first outlet and said second outlet but above said collection zone,

wherein said first inlet is positioned above the sieve and adapted to receive and pass a slurry at a rate and velocity into the housing above the sieve such that at least some of the liquid component(s) of the slurry will, as a flow through, entrains a first part of the solids out through said first outlet, the rate and velocity is such as to enable at least some oversize material to migrate across the sieve and pass through said second outlet, and at least some sieve passable solids of greater density than the entrained solids of the flow through to pass down through the sieve.

18. Apparatus of claim 17 wherein there is provided a drive whereby said sieve, in use, is capable of being actively shaken and/or vibrated.

19. Apparatus as claimed in claim 17 or 18 wherein said collection zone is a reservoir adapted so that collected solids as a slurry on demand (optionally with the addition of additional water) is fed as a slurry to a pressure vessel.

20. **A method of partitioning solids of a slurry three ways**, said method comprising providing a housing having an inlet, a first outlet, and a collection zone, and, disposed therein, a sieve disposed below said first inlet and said first outlet but above said collection zone,

passing a slurry via said inlet into the housing across the sieve and, in part, out of said first outlet whilst at least some of the solids of the slurry fall

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onto and/or through the sieve,

harvesting or using the solids that have passed through said sieve and
into said collection zone,

harvesting or disposing of those solids that have passed out of said first
outlet,

wherein said housing includes a second outlet via which a removing of those
solids collected on the sieve occurs.

21. A method as claimed in claim 20 wherein the harvesting or using of the solids that
pass out of said second outlet or into said collection zone is as a slurry.

22. A method as claimed in claim 20 or claim 21 wherein the harvesting or disposal of
the solids that pass out of said first outlet is as a slurry.

23. A method as claimed in any one of claims 20 to 22 wherein the harvesting or using
of the solids that pass through the sieve is by a slurry feed thereof from said collection zone
or from said second outlet into a pressure vessel from whence the solids may be expressed
under the action of water addition into such pressure vessel.

24. A method of any one of claims 20 to 23 wherein said slurry to be partitioned includes
solids for recycle use in an abrasive water jetting system.

25. Partitioning apparatus substantially as hereinbefore described with reference to any
one or more of the accompanying drawings.

26. A method of partitioning solids substantially as hereinbefore described with
reference to any one or more of the accompanying drawings.

27. Abrasive slurry cutting plant having a solids recycle arrangement, said plant or
recycle being substantially as hereinbefore described with reference to any one or more of
the accompanying drawings.

28. A method of handling abrasive solids materials substantially as hereinbefore
described with reference to one or more of the accompanying drawings.